Active Learning 2
Final Presentation

201835516 전강훈 201736206 권순형

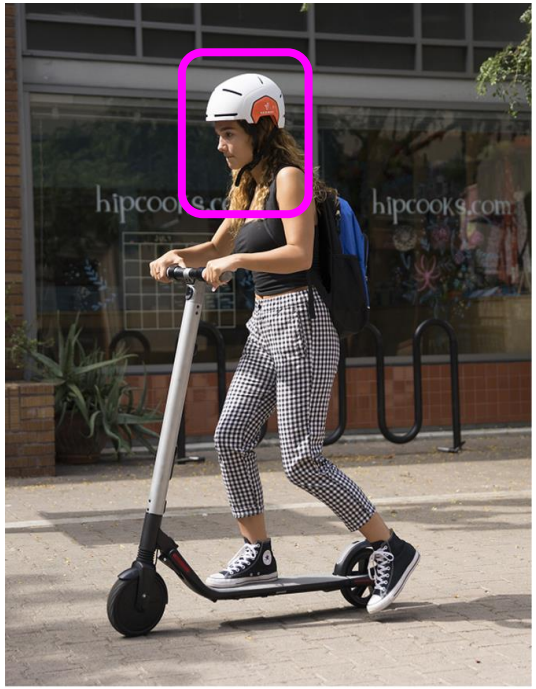
201636417 심우석 201735855 오찬희

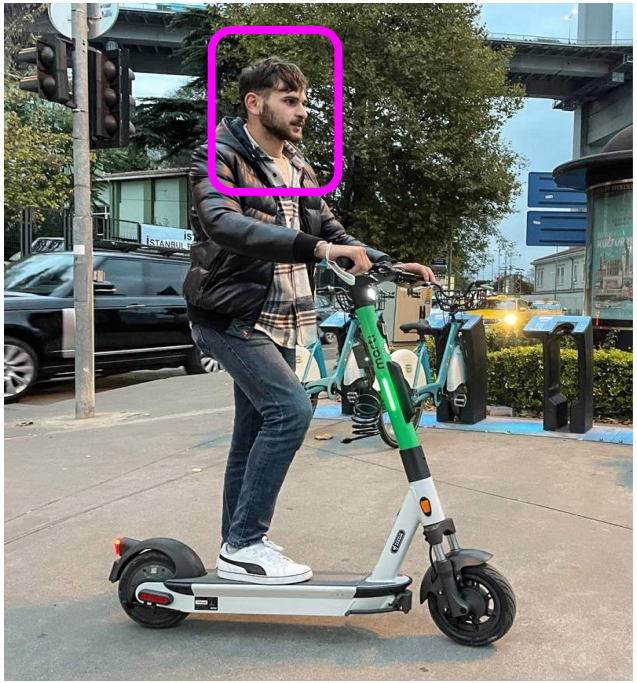
TABLE OF CONTENTS

01

Topic & Repository

Topic

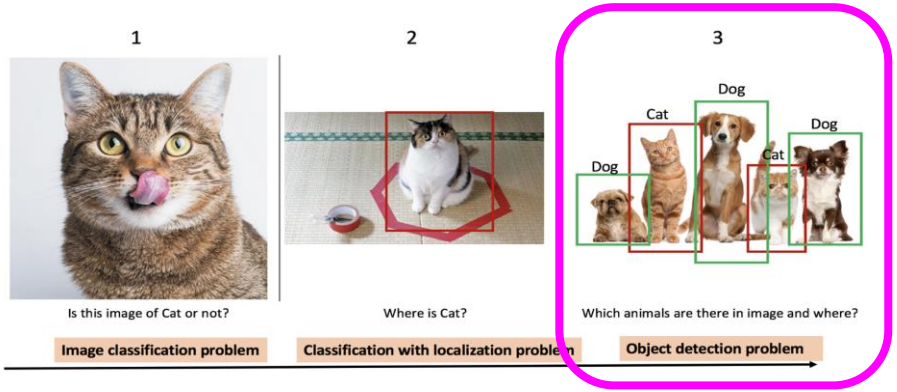




E Scooter - Helmet Problem

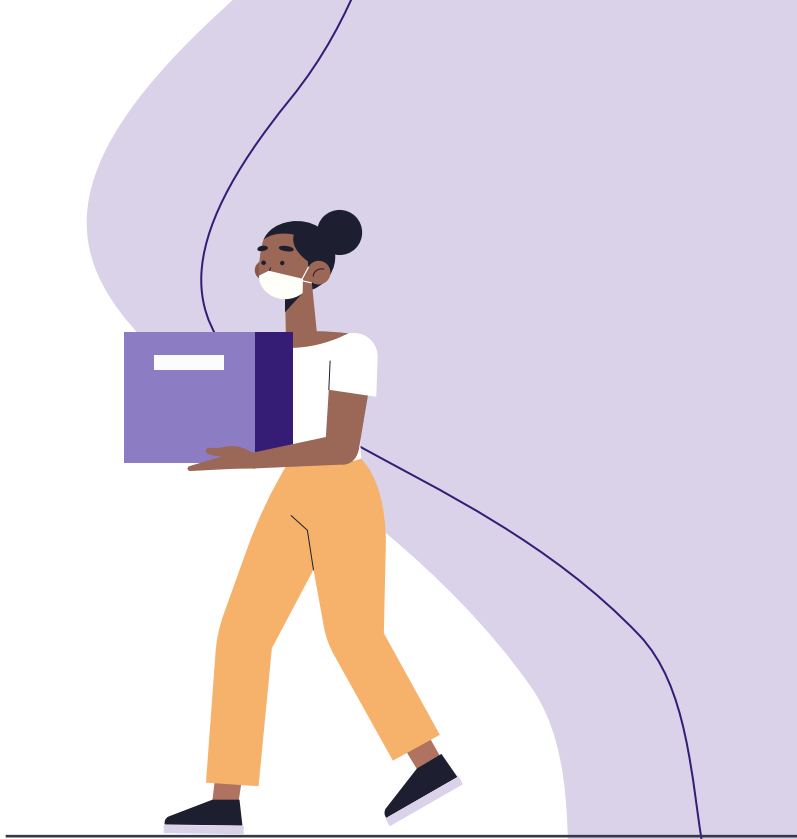
Repository

How? -> object detection



02

Dataset collection



Dataset Collection - photo taken by ourselves

Photo taken by ourselves - 103 sheets






Dataset Collection - search on internet

Search on Internet - 205 + 213 (Additional) -> 423 sheets

YouTube Yandex Google

Dataset Collection - Train / Valid

Dataset Structure

```
|--yolov5
|--data
    |--images          - 526 sheets
        |--train       - 425 sheets
        |--valid       - 101 sheets
    |--labels          - 526 txt file
        |--train       - 425 txt file
        |--valid       - 101 txt file
```

Yolo V5 학습을 위한 폴더 트리

Dataset - 526 sheets

Training Dataset - 425 sheets

Validation Dataset - 101 sheets

Dataset Labeling

Dataset Labeling

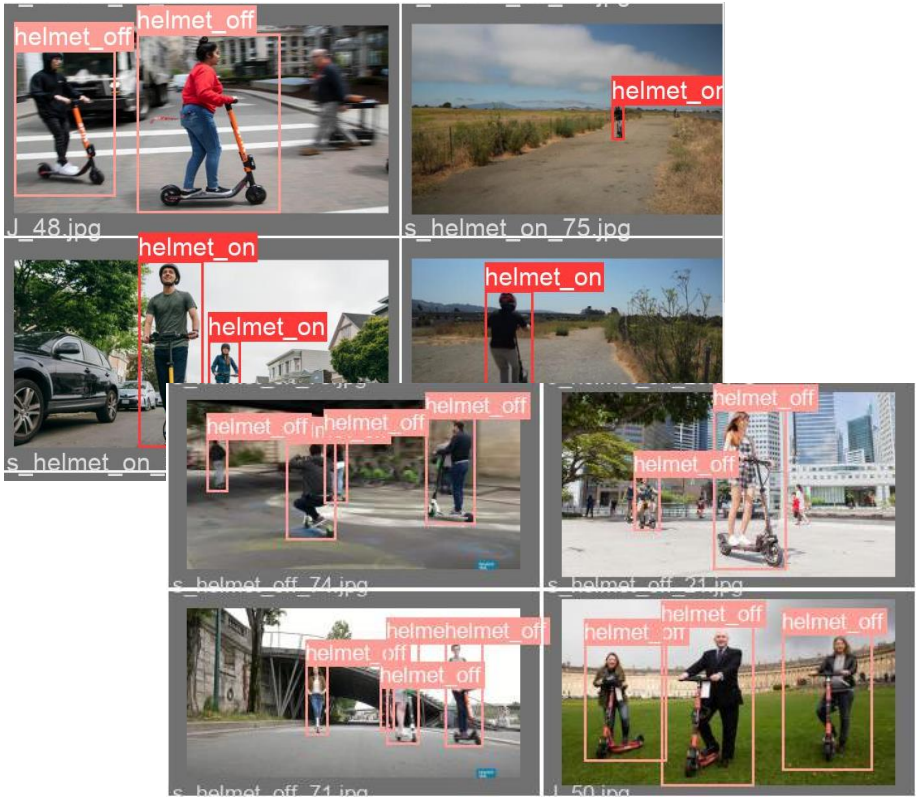
LabelImg

pypi v1.8.6 | build passing | lang en | lang zh | lang zh-TW

LabelImg is a graphical image annotation tool.

It is written in Python and uses Qt for its graphical interface.

Annotations are saved as XML files in PASCAL VOC format, the format used by ImageNet. Besides, it also supports YOLO and CreateML formats.



Dataset Collection - Augmentation

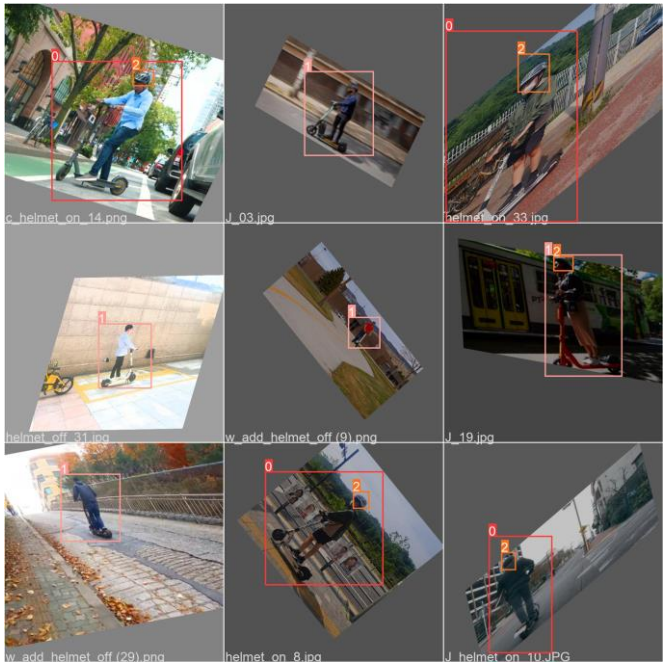
Dataset Augmentation - Using yolov5 Albumentation

Albumentations

pypi package 1.1.0 | CI passing

Albumentations is a Python library for image augmentation. Image augmentation is used in deep learning and computer vision tasks to increase the quality of trained models. The purpose of image augmentation is to create new training samples from the existing data.

```
hsv_h: 0.015  # image HSV-Hue augmentation (fraction)
hsv_s: 0.7  # image HSV-Saturation augmentation (fraction)
hsv_v: 0.4  # image HSV-Value augmentation (fraction)
degrees: 0.0  # image rotation (+/- deg)
translate: 0.1  # image translation (+/- fraction)
scale: 0.5  # image scale (+/- gain)
shear: 0.0  # image shear (+/- deg)
perspective: 0.0  # image perspective (+/- fraction), range 0-0.001
flipud: 0.0  # image flip up-down (probability)
fliplr: 0.5  # image flip left-right (probability)
mosaic: 0.0  # image mosaic (probability)
mixup: 0.0  # image mixup (probability)
copy_paste: 0.0  # segment copy-paste (probability)
```



03

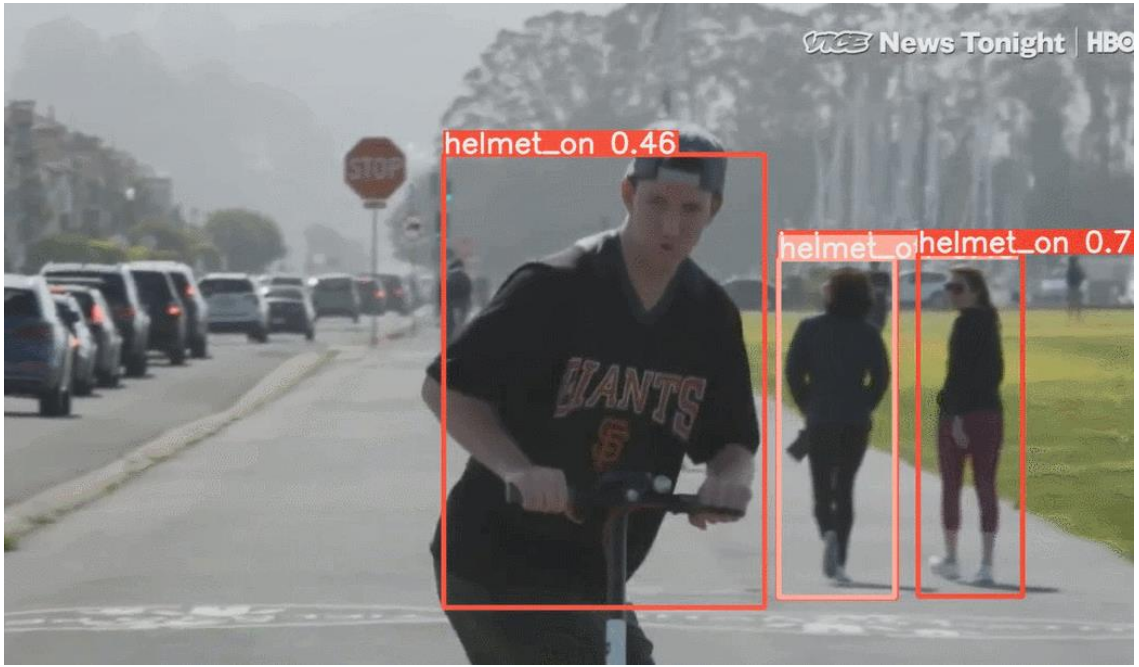
Transfer Learning

Problem : model don’t know E-scooter

Image used for Object Detection

AI doesn’t seem to detect e scooters, detected them as bicycle.

Result - (Only) photo taken by ourselves



The lack of datasets, so the results of learning are very low

Result - photo taken by ourselves + online data

There was a problem that even people who did not
ride the e scooter recognized it.

Dataset Augmentation (Yolov5 Albumentation)

Albumentation Parameter Tuning


```
hsv_h: 0.015  # image HSV-Hue augmentation (fraction)
hsv_s: 0.7  # image HSV-Saturation augmentation (fraction)
hsv_v: 0.4  # image HSV-Value augmentation (fraction)
degrees: 0.0  # image rotation (+/- deg)
translate: 0.1  # image translation (+/- fraction)
scale: 0.5  # image scale (+/- gain)
shear: 0.0  # image shear (+/- deg)
perspective: 0.0  # image perspective (+/- fraction), range 0-0.001
flipud: 0.0  # image flip up-down (probability)
fliplr: 0.5  # image flip left-right (probability)
mosaic: 1.0  # image mosaic (probability)
mixup: 0.5  # image mixup (probability)
copy_paste: 0.0  # segment copy-paste (probability)
```

Recognition Problem : Front, Rear

As datasets mainly related to the side were collected, problems related to this occurred due to low front, rear recognition rate.

Collect Additional Datasets

Search on Internet - 205 + 213 (Additional) -> 423 sheets

Improve the overall accuracy of the model

Safety Helmet Wearing Detection Based on YOLOv5 of Attention Mechanism

Z P Xu, Y Zhang, J Cheng and G Ge

University of Jinan, Jinan, 250022, China

Correspondence: cse_zhangy@ujn.edu.cn

Abstract. Aiming at problems of low accuracy and strong detection interference of the existing safety helmet wearing detection algorithms, an object detection algorithm by adding the squeeze-and-excitation block based on the YOLOv5 algorithm is proposed in this paper. The proposed method can not only obtain the weight of picture channel, but also accurately separate the foreground and background of the picture. Keeping all parameters unchanged, the proposed method and the YOLOv5 algorithm are applied to detect the safety helmet data set in the experiment. The result shows that the YOLOv5 algorithm with the squeeze-and-excitation block has an average detection accuracy of 94.5% for safety helmets and an average detection accuracy of 92.7% for human heads. The mAP value detected by the proposed method is 2% ~2.5% higher than using YOLOv5 algorithm directly.

In addition, we found a paper that adding a SE layer to an existing Yolov5 model can increase the overall accuracy of the model.

After that, we added SE layer to the existing yolov5 model code.

SE Layer Attention

```python
class SELayer(nn.Module):
    def __init__(self, c1, r=16):
        super(SELayer, self).__init__()
        self.avgpool = nn.AdaptiveAvgPool2d(1)
        self.l1 = nn.Linear(c1, c1 // r, bias=False)
        self.relu = nn.ReLU(inplace=True)
        self.l2 = nn.Linear(c1 // r, c1, bias=False)
        self.sig = nn.Sigmoid()

    def forward(self, x):
        b, c, _, _ = x.size()
        y = self.avgpool(x).view(b, c)
        y = self.l1(y)
        y = self.relu(y)
        y = self.l2(y)
        y = self.sig(y)
        y = y.view(b, c, 1, 1)
        return x * y.expand_as(x)
```

Common.py

```python
elif m is SELayer:
    channel = args[0]
    channel = make_divisible(channel * gw, 8) if channel != no else channel
    args = [channel]
```

yolo.py

```yaml
# YOLOv5 v6.0 backbone
backbone:
  # [from, number, module, args]
  [[-1, 1, Conv, [64, 6, 2, 2]],  # 0-P1/2
   [-1, 1, Conv, [128, 3, 2]],  # 1-P2/4
   [-1, 3, C3, [128]],
   [-1, 1, Conv, [256, 3, 2]],  # 3-P3/8
   [-1, 6, C3, [256]],
   [-1, 1, Conv, [512, 3, 2]],  # 5-P4/16
   [-1, 9, C3, [512]],
   [-1, 1, Conv, [1024, 3, 2]],  # 7-P5/32
   [-1, 3, C3, [1024]],
   [-1, 1, SPPF, [1024, 5]],  # 9
   [-1, 1, SELayer, [1024, 4]]
  ]
```

yolov5x.yaml

04

Evaluation & Analysis

Github & Wandb

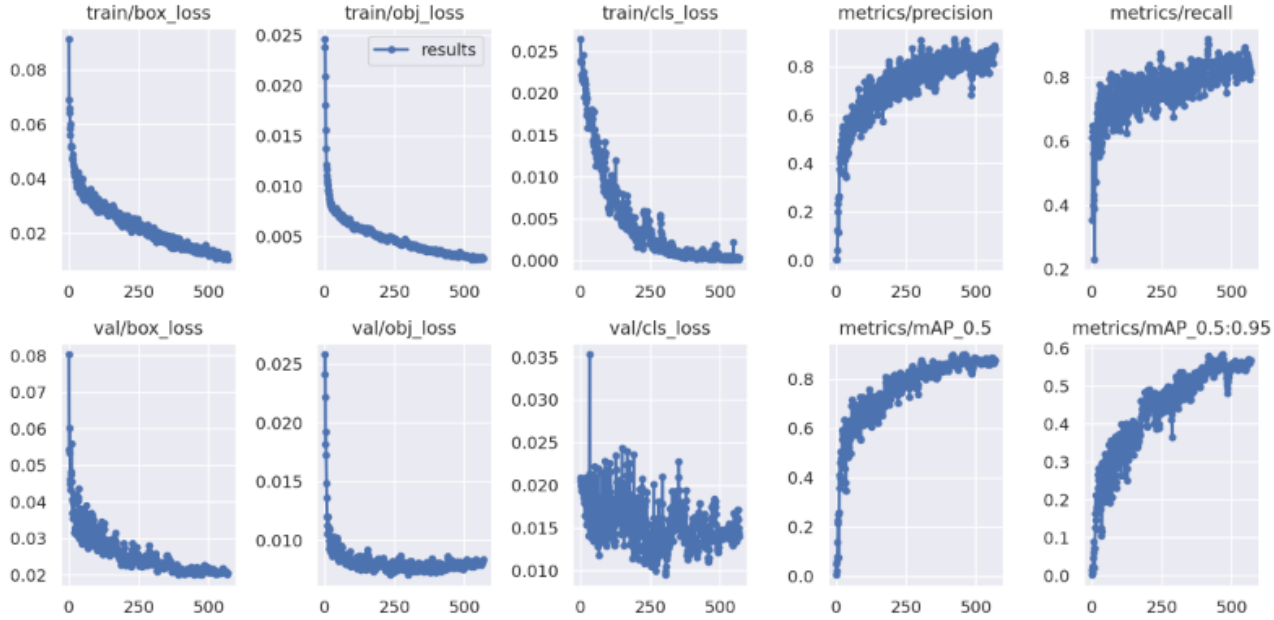
Wandb

Weights & Biases (wandb.ai)

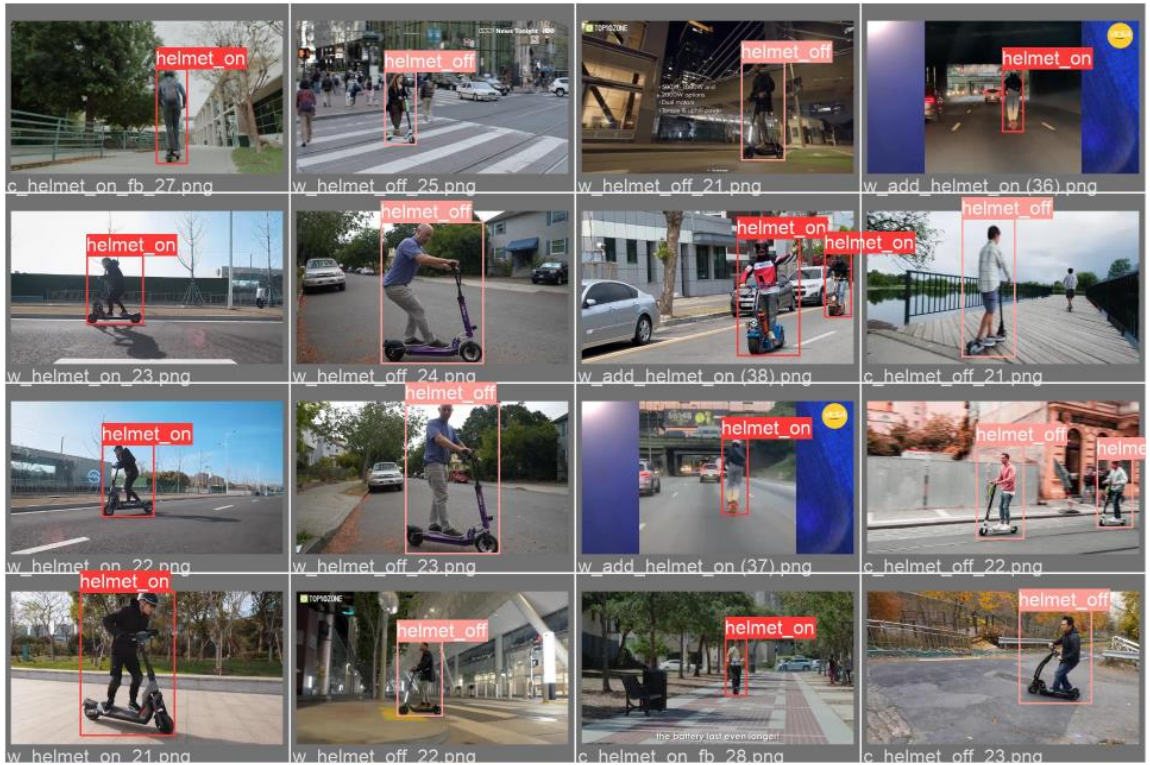
Github

https://github.com/dntjr41/DeepLearning_TermP

Train / Valid Result Graphs



Validation results



Result on Transfer learning

Before training, the trained model doesn't detected

At final-model, AI Now can find human with helmet-unequipped
after Testing with custom dataset.

Result on training : Final model

AI understands what is e scooter
Also AI can determine if Rider equipped helmet or not

Result on training : Final model

AI understands what is e scooter
Also AI can determine if Rider equipped helmet or not

Result on training : Final model

Result of video taken by ourselves

Self- Review on project : Feedback after project

권순형

- Through our experience in learning deep learning models, we realize that the right datasets and appropriate augmentation have a great influence on the results.
- I realized that deep learning can be used in a wide variety of ways.

심우석

- In order to improve overall accuracy, it would have been better to add a background to the dataset.
- It was difficult to find the right parameter for learning, but we liked the process of correcting the results by checking that they were getting better.

오찬희

- Through the project, We were able to analyze the results, add data sets, and expand performance through model attention to improve skills and understanding.
- I think it will be possible to improve performance enough with more data sets and time, and I hope that this improvement will contribute greatly to the detection of the electric scooter helmet.

전강훈

- Finding using studied Knowledge from this semester into project was resulted positive experience to me.
- Also the result was good, but though what if i choiced different methods such as difference on layers, or models, or other method and techniques to gain best answer.

05

Team Introduction

Team Introduction

권순형

201736206
ccsa3321@gachon.ac.kr

심우석

201636417
qkqh8639@gmail.com

오찬희

201735855
fasvvc@gmail.com

전강훈

201835516
sheep@gachon.ac.kr

References

Websites

- Tzutalin , labelImg project, https://github.com/tzutalin/labelImg#usage, updated on 2022.04.30, accessed on 2022.05.22
- Albumentations-team , albumentations , https://github.com/albumentations-team/albumentations, updated on 2022.02.13, accessed on 2022.05.22
- Squeeze-and-Excitation Networks, https://arxiv.org/pdf/1709.01507.pdf
- Ultralytics, YOLO v5 repository, https://github.com/ultralytics/yolov5, last updated on 2022.05.22, accessed on 2022.05.22
- Wandb, https://wandb.ai/site
- Yolov5 tutorial, https://sguys99.github.io/ds01
- https://iopscience.iop.org/article/10.1088/1742-6596/2213/1/012038

THANKS

Do you have any questions?

Team B -
심우석, 전강훈, 오찬희, 권순형